

- [54] **PROCESS FOR APPLYING CONTACTS**
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- [51] Int. Cl.² **B23K 1/06; B23K 21/02**
- [58] Field of Search **29/470.1, 630 R, 497.5, 29/475, 471.1; 228/1, 4, 5**

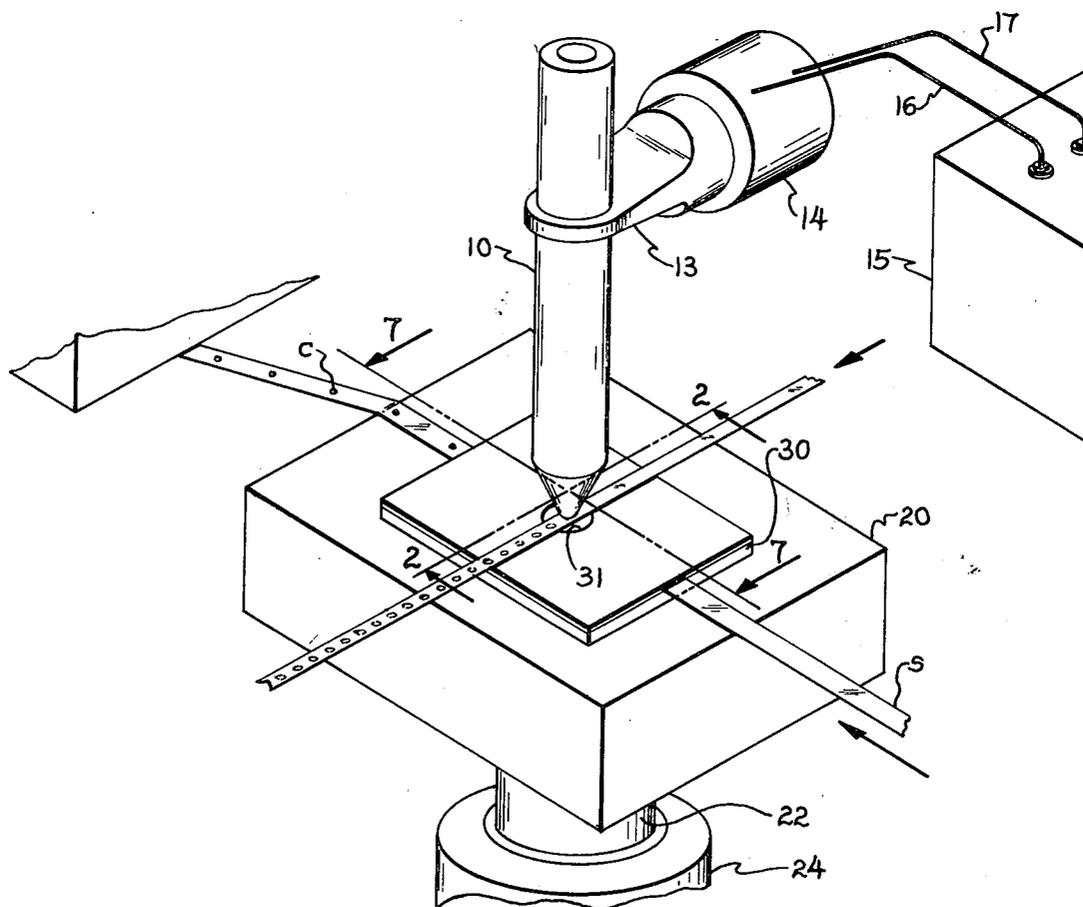
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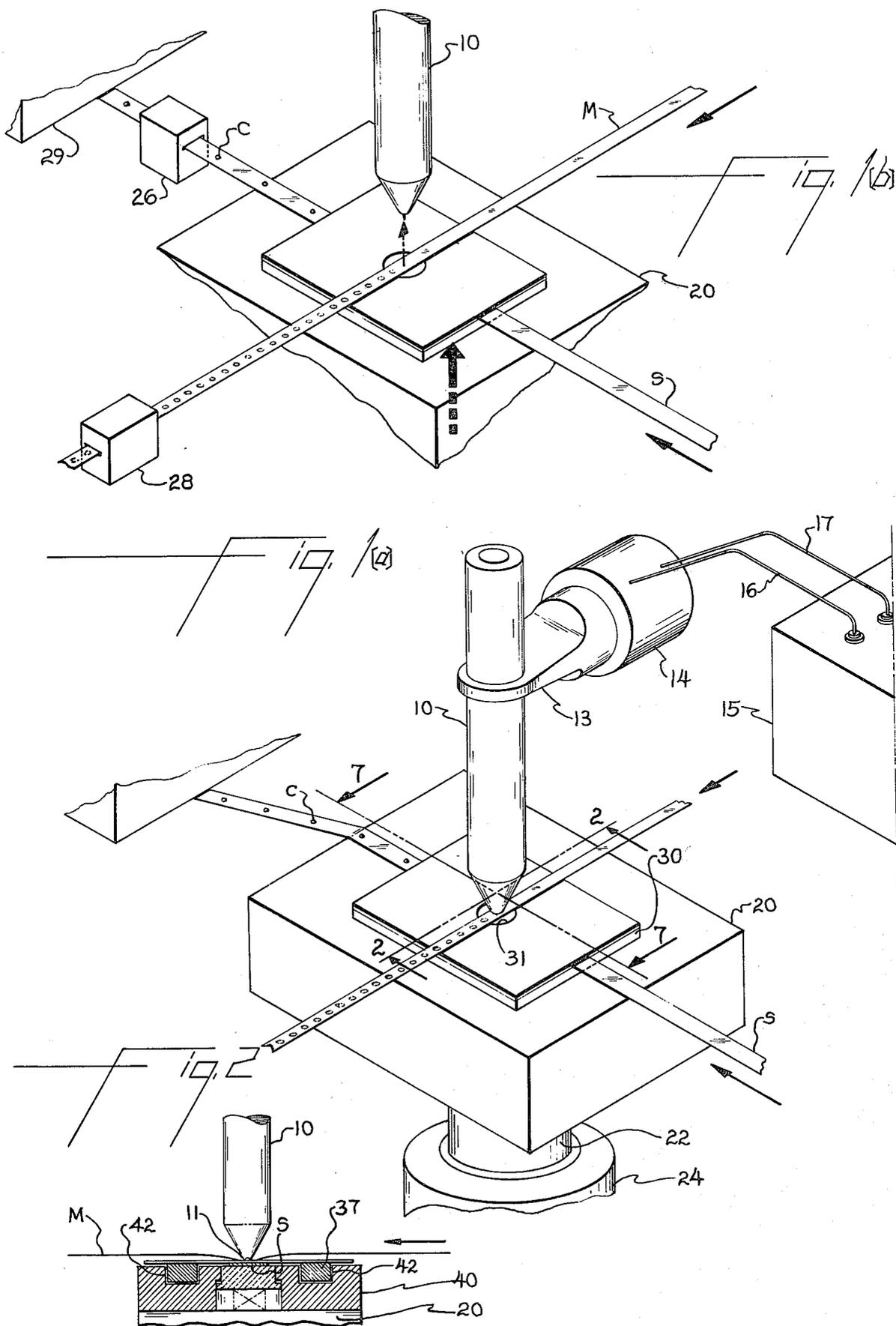
Primary Examiner—Victor A. Dipalma

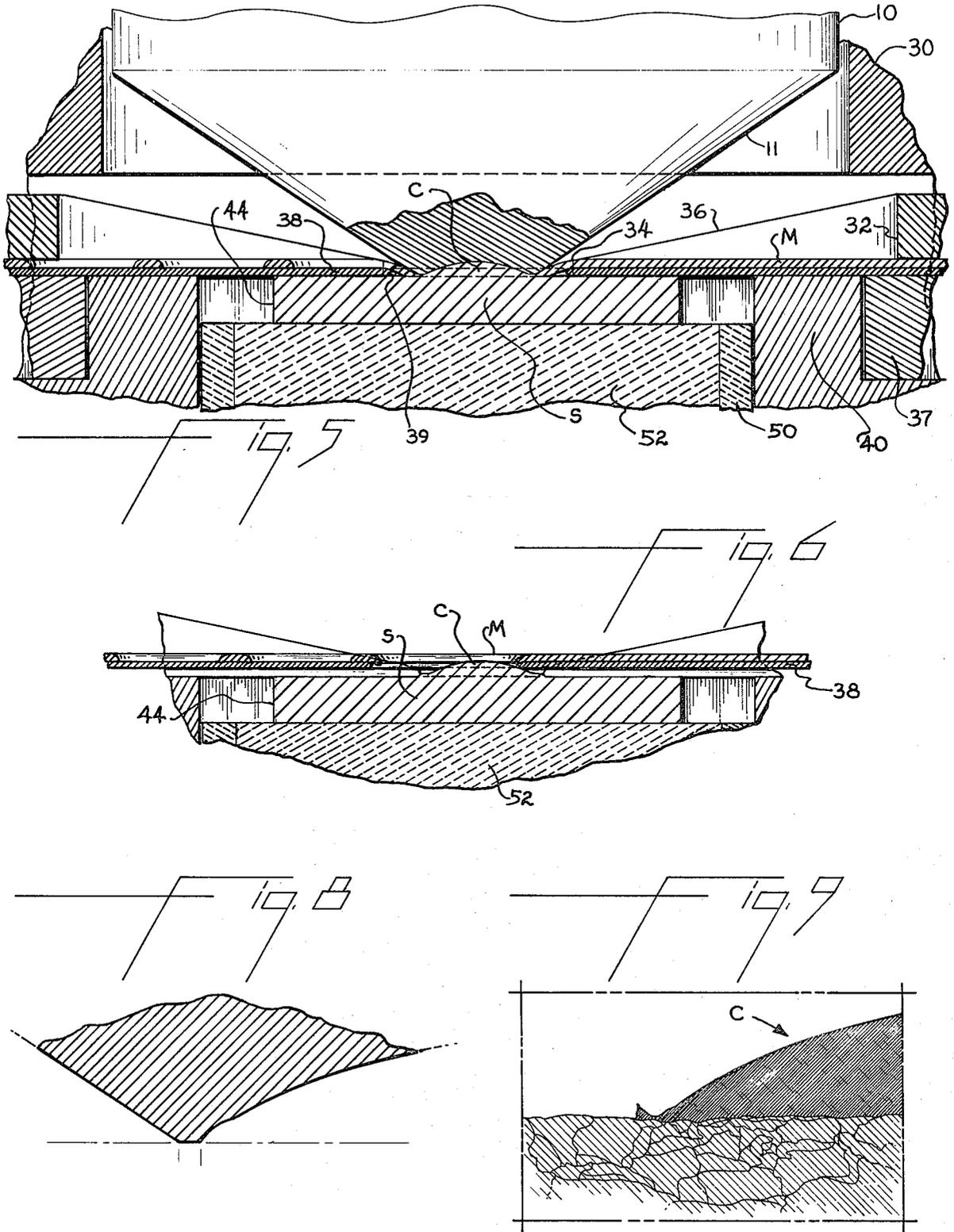
[57] **ABSTRACT**
 A process and apparatus are provided for applying gold contacts to a metal member by superposing a gold foil element with the metal member, ultrasonically welding a portion of the gold foil to the member, and stripping the unwelded portion from the metal member to leave the welded portion attached to the member. The apparatus comprises an ultrasonic welding unit, a welding zone for receiving and superposing the foil element and metal member, a stripping plate disposed in the welding zone between the element and the member, having an opening therein for superposing and welding the element and member. The gold foil element is welded to the metal member and the stripping plate separates the unwelded portion of the gold foil from the welded portion to leave the welded portion of the gold foil attached to the metal member.

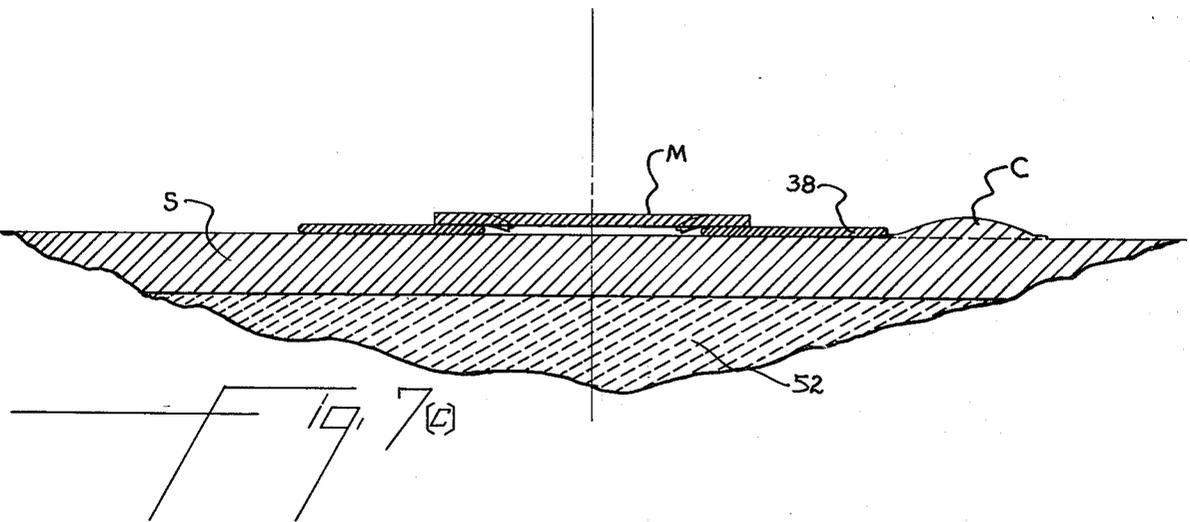
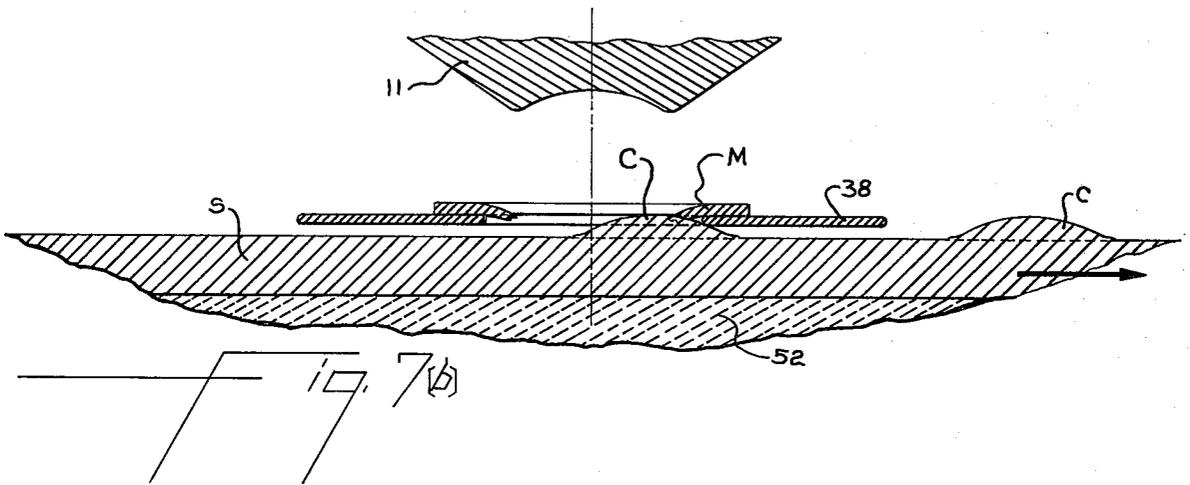
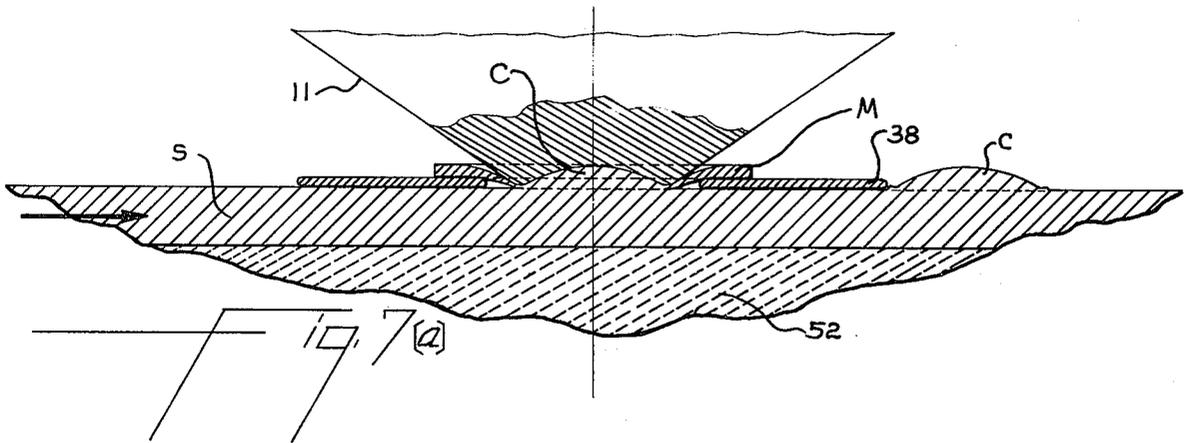
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5 Claims, 12 Drawing Figures









PROCESS FOR APPLYING CONTACTS

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to an apparatus and method for fabrication of contacts for use with electrical circuits, and particularly relates to an apparatus and method for attaching an electrical contact to a metal member, and more particularly relates to an apparatus and method for welding a contact element to a metal member to produce an electrical contact suitable for fabricating electrical sockets or terminals.

2. Description of the Prior Art

Electrical sockets and terminals for establishing electrical contact are well known in the prior art. The general requirements for such sockets and terminals are that they have surfaces for establishing electrical contact and resisting corrosion and wear. It is well known to gold plate the interior surfaces of a socket or the outer surface of a terminal to insure good electrical contact. However, the gold plating process of the prior art is both expensive and inefficient. Whether the strip material from which the sockets or terminals are to be fabricated is coated on one or both sides, the amount of gold applied to the surface is greater than is actually required for establishing good electrical contact. In an effort to decrease the amount of gold used and to insure good electrical contact between sockets and terminals, either the sockets or terminals or both have been fabricated from base metal strips having a small raised gold contact or dot welded on what is to become the contact surface of the socket or terminal. Although, this latter type of socket or terminal provides for substantial economy in conserving the amount of gold required for providing electrical contact in sockets and terminals, it requires either substantial manual processing operations or complex and expensive automatic equipment. Various apparatus for welding electrical contacts to strip stock are described in U.S. Pat. Nos. 3,114,828; 3,299,246 and 3,382,575. All the aforementioned apparatus include mechanical cutters for severing the welded contact from the strip material. Another method and apparatus using ultrasonic welding techniques is disclosed in U.S. Pat. No. 3,357,090, and uses a flame to cut a wire welded to a stock member.

SUMMARY OF THE INVENTION

According to the present invention there is provided a process for attaching a metal element on a metal member comprising the steps of

superposing a metal element with a metal member, ultrasonically welding a selected portion of the metal element to the metal member, and

stripping the unwelded portion of the metal element from the welded portion to leave the welded portion of the element attached to the metal member.

The invention also provides an apparatus for attaching an element to a metal member, comprising, a welding zone for receiving a metal element and a metal member and superposing the metal element with the metal member,

means for welding a selected portion of the metal element to the metal member, and

means for stripping the unwelded portion of the metal element from the metal member and leaving the

welded portion of the element attached to the metal member.

In a preferred embodiment of the invention the means for stripping comprises a plate disposed between the metal element and the metal member. The plate having an opening for superposing the metal element with the metal member and welding a selected interior portion of the metal element to the metal member. The metal member, having a selected portion of the metal element welded thereto, is advanced from the welding station. The unwelded portion of the metal element is stripped from the welded portion by the stripping plate between the element and the member.

The process and apparatus of the invention provide for reliably attaching a contact to a metal member from which sockets or terminals may then be fabricated by conventional techniques well known in the prior art. The process and apparatus of the invention provide for substantial economy by eliminating complex apparatus or manual operations for cutting or burning the contact source material from the metal member to which it is attached. Additionally, machining steps required to render the contact surface uniform for later use are also eliminated. Further, the expensive contact source material, e.g., gold, not attached to the metal stock member but stripped therefrom can be readily recycled for subsequent use.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1(a) and (b) are perspective drawings of a preferred embodiment of an apparatus of the invention.

FIG. 2 is an elevation drawing of the embodiment of the invention of FIG. 1 broken away and in partial section along line 2—2 of FIG. 1.

FIGS. 3—6 are detailed drawings in cross-section illustrating the action of the stripping plate in the direction of travel of the metal foil element.

FIGS. 7(a), (b) and (c) are detailed drawings broken away and in cross-section illustrating the action of the stripping plate in the direction of travel of the metal strip member.

FIG. 8 is an elevation drawing in cross-section and broken away to illustrate the recess in the welding head.

FIG. 9 is a cross-section partially broken away illustrating a contact dot prepared according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

The apparatus and process of the invention are described with reference to the attached drawings wherein the same numerals are used throughout the figures to identify the same elements.

The apparatus of the invention comprises an ultrasonic welding unit 10 having a conical lower section or horn 11 terminating in a recessed circular tip 12. The welding unit 10 is mounted in a bracket 13 connected to member 14 which is suitably mounted on a housing provided for the apparatus but not shown. An ultrasonic power source 15 is connected to member 14 by wires 16 and 17.

Table 20 is actually mounted on piston rod 22 of an air cylinder 24 fixedly mounted on a housing (not shown) for the apparatus. Contact material M and strip member S are conventionally supplied to a welding zone in superposed relationship and advanced therefrom by suitable advance mechanisms 26, 28. Strip member having contacts C attached thereto can be

wound on rolls or supplied directly to other automatic equipment 29 for fabricating sockets or terminals.

The welding station zone on table 20 comprises a plate 30 having a cylindrical opening 31 therein for receiving the conical welding horn 11 of the ultrasonic welding unit 10. Plate 32 has a frusto-conical open section 36 terminating in opening 34 in the welding zone for receiving the horn 11 with welding tip 12. The contact foil material M is threaded between plate 32 and stripping plate 38. Stripping plate 38 has circular opening 39 for superposing and welding contact material M on the strip member S. The stripping plate 38 has edge members 37 for allowing the plate to float with respect to the strip member S.

Plate 40, having channels 42 for receiving the edge members 37 of the stripping plate 38, is mounted on table 20. Plate 40 has a longitudinal channel 44 therein for receiving the strip material S, and a circular channel 46 having expanded section 48 in communication with channel 44.

A weld backing member 50, having a suitable replaceable insert member 52 and a flange member 54, is mounted in cylindrical recess 46 with the flange 54 in the expanded cylindrical section 48. Member 50 is spring loaded by spring 58.

The operation of the apparatus and process may be readily understood with reference to the drawings and particularly FIGS. 3-6 and FIGS. 7(a), (b) and (c). The strip material S to which the contact is to be attached is threaded through channel 44 of plate 40. The upper surface of the strip material S is held against the stripping plate 38 by the spring loaded weld backing member 50. The contact material, preferably a gold foil, is threaded between stripping plate 38 and plate 32, having opening 34 in the welding zone. In the preferred embodiment of the apparatus strip material S is step fed in a first direction and the contact material M is step fed in a second direction perpendicular to strip S. Air cylinder 24 is activated and piston rod 22 raises the table 20 until tip 12 of the ultrasonic welding unit 10 engages the contact material M. The welding unit 10 is energized and the superposed contact material M and strip material S in the welding zone is urged against tip 12 by the spring loaded member 50. Spring 58 is selected to provide a suitable welding force between tip 12 of the welding horn 11, and the contact material M and strip material S in the welding zone. When the weld is completed, air cylinder 24 is deactivated and table 20 lowered. The strip member S is advanced in one direction by advance means 29 and the contact material is advanced in a second direction perpendicular thereto by advance means 28. The stripping plate 38 functions to stress the contact material outside the area of the weld. The contact material is stressed and begins to separate from the portion welded to the strip member

S. The contact element C lifts the floating stripping plate. The stripping plate 38 stresses the contact material along the perimeter outside the area of the weld, until the entire perimeter of the contact material outside the welded area is separated from the contact element C welded to the carrier strip S.

The resultant contact element is shown in detail in cross-section in FIG. 9. The nonuniform perimeter edge of contact element results from the stress separating of the contact material.

In the preferred embodiment of the invention the contact member M is preferably a thin gold foil. The strip member S may be any conventional metal suitable for fabricating sockets, terminals or other electrical contact members. However, the particular materials useful in the process of the invention are not so limited. For example, any element which can be soldered to any other member may be used. Similarly, the process is not limited to preparation of contacts for electrical circuits, but may be used for attaching elements on members for other purposes. In view of variations, equivalents and modifications to the invention which will be obvious to others skilled in the art, the invention is not intended to be limited except by the appended claims.

What is claimed is:

1. A process for attaching an element to a member comprising,
 - supplying a member on one side of a plate to a welding zone,
 - supplying an element on the opposite side of the plate to the welding zone,
 - superposing the element with the member in the welding zone through an opening in the plate,
 - welding a selected portion of the element to the member through the opening in the plate, and
 - stripping the unwelded portion of the element from the welded portion by advancing the element and the member on opposite sides of the plate from the opening in the plate in the welding zone.
2. A process as recited in claim 1, wherein said stripping comprises stressing the element along the perimeter of the unwelded portion of the element to separate the element from the member.
3. A process, as recited in claim 2, wherein said stripping comprises engaging the welded portion of the element attached to the member against one side of the plate and lifting the plate away from the member and the unwelded portion of the element on the opposite side of the plate away from the member.
4. A process, according to claim 1, wherein the element is ultrasonically welded to the member.
5. A process, according to claim 1, wherein the element is a gold foil.

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